

CLAIMS

What is claimed is:

1. A method for surgically changing vision of a subject eye, comprising the steps of:
providing a corneal-pocket keratome, including

- 5 a corneal-pocket blade assembly having a corneal-pocket blade and a blade support assembly, and
- a keratome drive mechanism to drive the keratome blade support assembly whereby the corneal-pocket blade travels in a known relationship to a corneal restraint device;
- 10 providing an intracorneal lens adapted to change focal properties of the subject eye when installed interior to a cornea of the subject eye;
- positioning the corneal-pocket keratome in contact with the subject eye;
- controlling the corneal-pocket keratome to cut a corneal pocket in the cornea of the subject eye; and
- disposing said intracorneal lens within said pocket.

- 15 2. The vision-changing method of claim 1, wherein the corneal restraint device is a corneal support shoe for supporting a cornea of the subject eye.

3. The vision-changing method of claim 1 wherein the lens inserted in the corneal pocket has a feature to enhance retention in the corneal pocket.

- 20 4. The vision-changing method of claim 3 wherein the lens swells after disposal within the corneal pocket.

5. The vision-changing method of claim 3 wherein the lens has circumferential irregularities to interfere with corneal tissue circumferential to the corneal pocket.

6. The vision-changing method of claim 3 wherein the lens has a surface expanse, and provides focal length variations over the surface expanse.

7. The vision-changing method of claim 1 including the step of imposing a plurality of focal changes to the subject eye.

8. The vision-changing method of claim 6 wherein focal length varies as a function of a meridian of the lens.

5 9. The vision-changing method of claim 6 wherein focal length varies as a function of a radius of the lens.

10. The vision-changing method of claim 7 wherein the focal changes compensate for presbyopia.

10 11. The vision-changing method of claim 7 wherein the focal changes compensate for astigmatism.

12. The vision-changing method of claim 1 wherein the intracorneal lens corrects myopia.

13. The vision-changing method of claim 1 wherein the intracorneal lens corrects hyperopia.

15 14. The vision-changing method of claim 1 wherein said intracorneal lens includes a central focal length reducing region of not more than 3mm diameter, and wherein the lens is disposed substantially at a pupil center of the subject eye.

15. The vision-changing method of claim 7 wherein the focal changes compensate for any combination of vision defects of the subject eye from the group of vision defects including presbyopia, astigmatism, myopia and hyperopia.

16. The vision-changing method of claim 3 wherein the lens is a Fresnel type.

20 17. The vision-changing method of claim 1 wherein the intracorneal lens includes material having a plurality of indices of refraction.

18. The vision-changing method of claim 1, further including the step of providing a cornea positioning ring for restraining the cornea of the subject eye.

19. The vision-changing method of claim 18 wherein the positioning ring of is readily removable from the keratome drive mechanism and replaceable thereon by finger manipulation without a need for tools.

20. The vision-changing method of claim 1 wherein the corneal restraint device is readily removable from the keratome drive mechanism and replaceable thereon by finger manipulation without a need for tools.

21. The vision-changing method of claim 2 wherein the corneal support shoe is pivotably disengageable from the cornea.

22. The vision-changing method of claim 1 wherein the corneal pocket blade is readily removable from the keratome drive mechanism and replaceable thereon by finger manipulation without a need for tools.

23. A replaceable corneal pocket blade for use in the vision-changing method of claim 22.

24. The replaceable corneal pocket blade of claim 23 wherein the material is sterilizable.

25. A replaceable corneal restraint device for use in the vision-changing method of claim 20.

26. The replaceable corneal restraint device of claim 20 wherein the material is sterilizable.

27. The vision-changing method of claim 1 wherein the pocket formed has an interior and an opening incision formed through corneal surface tissue, the opening incision having a largest dimension which is a width, and the pocket interior having a maximum width which is parallel to and greater than the opening incision width.

28. The vision-changing method of claim 27 wherein the corneal pocket blade assembly oscillates lateral to a primary direction of travel, and the amplitude of lateral oscillation increases as the blade travels forward into the cornea.

29. The vision-changing method of claim 1 wherein the blade support assembly includes a blade guide which travels with the corneal pocket blade at a known distance therefrom.

30. The vision-changing method of claim 29 wherein the blade guide contacts the subject eye during formation of the corneal pocket.

31. The vision-changing method of claim 29 wherein the blade guide is separated from the subject eye by a corneal support shoe.

32. The vision-changing method of claim 1 wherein the corneal pocket is formed without a corneal support shoe contacting the subject eye.

33. The vision-changing method of claim 29 wherein the blade guide contacts the corneal support shoe during incision.

34. The vision-changing method of claim 1 wherein the corneal restraint device supports the cornea at an interface surface, and the interface surface of the corneal restraint device is contoured.

35. The vision-changing method of claim 2 wherein the corneal support shoe supports the cornea at an interface surface, and the interface surface is substantially flat.

36. A corneal-pocket keratome, comprising:

a corneal-pocket blade assembly having a corneal-pocket blade supported by a blade support assembly, the blade having a cutting edge on a portion of the blade which is cantilevered from the blade support assembly to protrude therefrom;

a keratome drive mechanism supporting the corneal-pocket blade assembly, the drive mechanism including

a primary drive mechanism to drive the blade assembly in a primary path of travel generally perpendicular to a focal axis of the eye, and

5 a lateral drive mechanism to impart movement to the blade assembly in a direction lateral to the primary path of travel; and

a corneal restraint device attached to the keratome drive mechanism.

37. The corneal-pocket keratome of claim 36 wherein the primary path of travel is a single direction.

10 38. The corneal-pocket keratome of claim 36, wherein the lateral drive mechanism is controllable to vary a length of lateral movement of the blade assembly.

39. The corneal-pocket keratome of claim 36, wherein the lateral drive mechanism increases a length of lateral movement of the blade assembly as the blade assembly proceeds in the forward direction of travel.

15 40. The corneal-pocket keratome of claim 36, wherein the lateral drive mechanism imparts a laterally oscillating movement to the blade assembly.

41. The corneal-pocket keratome of claim 36, wherein the corneal-pocket blade support includes a corneal pocket wall-thickness guide to control a corneal-pocket outer wall thickness.

20 42. The corneal-pocket keratome of claim 41, wherein the corneal-pocket wall-thickness guide includes a guide edge, the guide edge substantially matching a shape of a portion of the cutting edge of the corneal-pocket blade protrusion and being disposed at a controlled distance from said portion of the cutting edge.

43. The corneal-pocket keratome of claim 41, wherein the corneal-pocket wall-thickness

guide is disposed in sliding contact with the corneal restraint device.

44. The corneal-pocket keratome of claim 43, wherein the corneal-pocket wall-thickness guide is disposed in sliding contact with an applanation shoe side opposite a cornea-restraining side of the applanation shoe.

5 45. The corneal-pocket keratome of claim 36, wherein the corneal restraint device is a corneal support shoe for supporting a cornea of the subject eye.

46. The corneal-pocket keratome of claim 36, further including a cornea positioning ring for restraining the cornea of the subject eye.

10 47. The corneal-pocket keratome of claim 46, further including a positioning ring retention feature having a finger-operable mechanism to release the positioning ring from the keratome drive mechanism by finger manipulation without a need for tools.

48. The corneal-pocket keratome of claim 36, further including a corneal restraint device retaining feature which is engageable and releasable by finger manipulation without a need for tools.

15 49. The corneal-pocket keratome of claim 36 wherein the corneal restraint device is pivotably disengageable from the cornea.

20 50. A corneal-pocket blade assembly for use in the corneal-pocket keratome of claim 36, comprising a corneal-pocket blade to be cantilevered from the blade support assembly so as to protrude therefrom, and having a cutting edge on a portion of the cantilevered blade distal from the blade support assembly.

51. A corneal restraint device for use in the corneal-pocket keratome of claim 48, including a mating feature engageable with said corneal restraint device retaining feature.